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LISTS OF SPECIES

Fish fauna of small streams of the Catua-Ipixuna Extractive Reserve, State of Amazonas, Brazil

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Abstract
This study was conducted in an Amazonas state conservation unit, the Catuá-Ipixuna Extractive Reserve (Catuá-Ipixuna RESEX). The main purpose was to provide an ichthyological survey of its small streams, all them tributaries of the Solimões River. Nine small streams (up to 4 m width and 1 m depth) were sampled in September 2006. A total of 1,525 specimens were captured, belonging to 78 species, 24 families and eight orders. Eight species had higher abundances and represented altogether 61.4 % of all collected specimens (*Hemigrammus belotii*, *Microphilypnus amazonicus*, *Physopyxis ananas*, *Apistogramma agassizii*, *Elachocharax pulcher*, *Apistogramma* cf. *cruzi*, *Gladioglanis conquistador* and *Copella nigrofasciata*). Based on the high number of singletons and doubletons present in our samples, as well as the estimated number of species for those streams (106 spp.), we believe that the total fish species richness present in the Catuá-Ipixuna Extractive Reserve may be considerably higher than indicated by our samples. This seems especially true when considering the dimensions of the Catuá-Ipixuna RESEX and the dense hydrographic network present in the area.

Introduction
Although not so conspicuous as the large rivers that dominate the landscapes in the Amazon region, the vast numbers of small forest streams constitute one of the main components of that fluvial system (Fitkau 1964; Welcomme 1985). These small water courses are hydrologically and ecologically connected to larger streams and rivers, and are a source of many essential resources (e.g. nutrients, particulate and dissolved organic matter, invertebrates) for the maintenance of the physical, chemical, ecological and biological integrity of the whole system (Vannote et al. 1980; Nadeau and Rains 2007; Wipfli et al. 2007). Low order streams may also be used as temporary refuges, feeding and spawning areas to migratory fish species (Meyer et al. 2007).

Despite their reduced area and apparent low structural complexity, small forest streams harbor a rich fish fauna (Walker and Henderson 1996; Sabino and Zuanon 1998; Lowe-McConnell 1999; Buhrnheim and Cox-Fernandes 2003; Mendonça et al. 2005; Anjos and Zuanon 2007). However, published studies concerning the ichthyofauna of Amazon streams are still scarce and mainly concentrated to the vicinity of Manaus in central Brazilian Amazon.

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

The main purpose of this study is to provide an ichthyological survey of small, 2nd and 3rd order streams (according to Horton's scale, modified by Strahler; see Petts 1994) at the Catuá-Ipixuna Extractive Reserve (Catuá-Ipixuna RESEX), a conservation unit in the Solimões River basin west of Manaus. There are no studies about stream fish fauna in that area, and the information presented herein will help to increase the knowledge about fish species distribution and diversity in the Brazilian Amazon.

Material and Methods

The Catuá-Ipixuna Extractive Reserve occupies an area of 217,486 hectares located between Tefé and Coari municipalities, state of Amazonas, Brazil (IPAAM 2003). The name of the Reserve refers to its two largest streams, Catuá (03°47'13.1" S, 64°03'0.6" W) and Ipixuna (3°50'31.2" S, 63°52'22.7" W), both tributaries of the right bank of the Solimões River (Figure 1).

Nine small streams were sampled in 20 days of field work in September 2006 (dry season): four in Catuá basin (Stream 1: 03°58'21.5" S, 64°20'20.8" W; Stream 2: 03°58'32.9" S, 64°21'13.3" W; Stream 3: 03°58'01.9" S, 64°20'47.2" W; Stream 4: 03°47'52.5" S, 64°10'31.8" W) and five in the Ipixuna basin (Stream 5: 03°52'20.3" S, 63°54'32.2" W; Stream 6 - affluent of the Marco Stream: 03°56'14.7" S, 63°56'26.1" W; Stream 7 - affluent of the Marco Stream: 03°55'48.4" S, 63°56'34.1" W; Stream 8 - affluent of the Marco Stream: 03°55'44" S, 63°56'33.7" W; Stream 9: 03°54'00" S, 63°56'03.4" W).

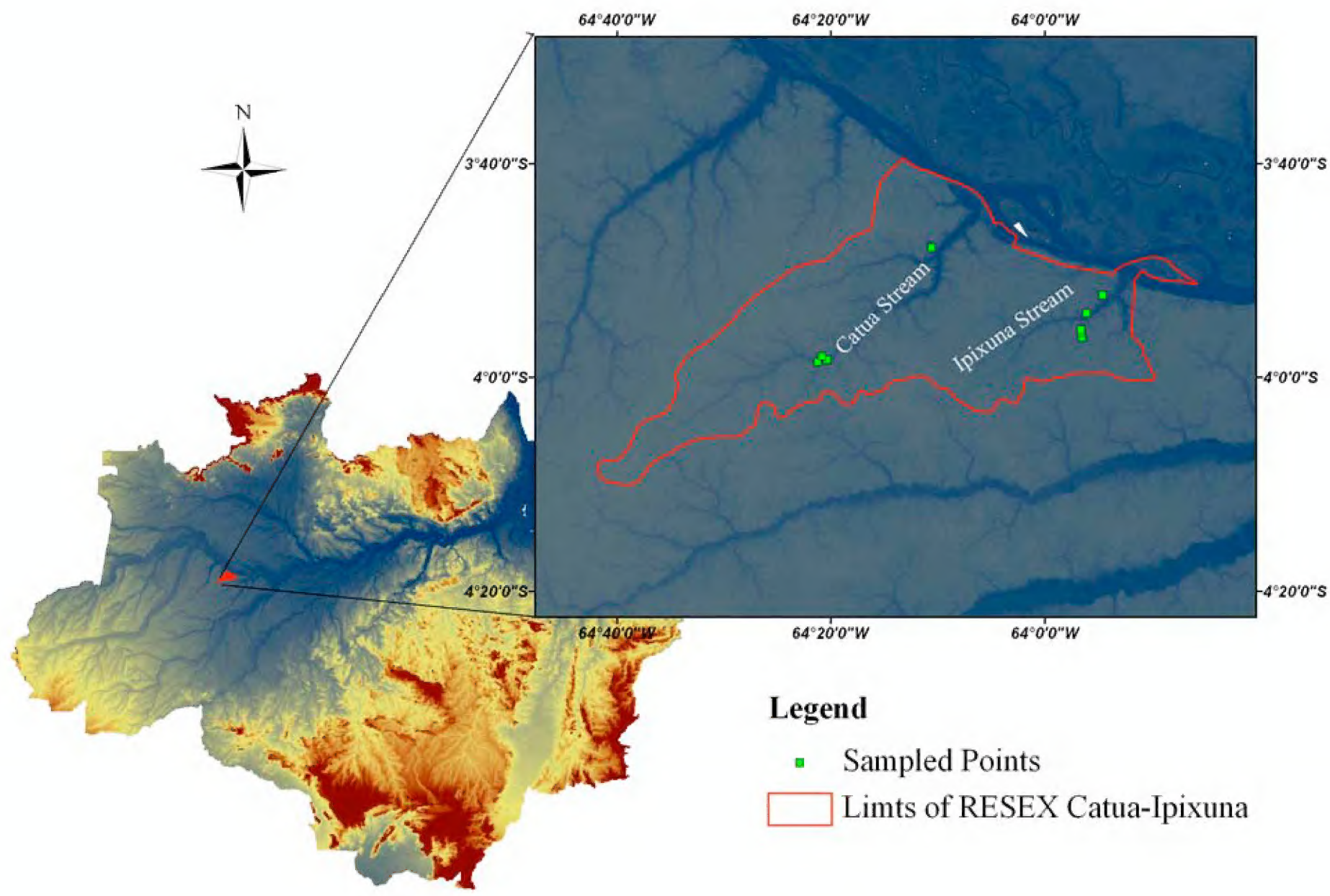

Figure 1. Geographic location of the study area at Catuá-Ipixuna Extractive Reserve. Red line depicts the Reserve limits. (Source: SRTM image, NASA).

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Studied streams showed mean width and depth of 2.0 m and 0.60 m respectively, and were largerly surrounded by primary forest, with substrate composed mainly by coarse litter and sand patches. Four streams are located in *terra-firme* areas (upland, non floodable) and five in *várzea* areas (lowlands seasonally flooded by turbid water rivers).

Each sample station consisted of a 50 m reach of stream. The sampling effort was standardized and based on the use of hand nets (0.4 m^2 area, 2 mm mesh) by two collectors during a period of 120 minutes in each stream (Mendonça et al. 2005).

Fishes were preserved in 10 % buffered formalin in the field and later transferred to 70 % ethanol. Specimens were sorted and identified at the Fish Collection of the *Instituto Nacional de Pesquisas da Amazônia* (INPA) in Manaus. Species were identified with the use of specific dichotomic keys and ichthyofaunal catalogues (e.g. Géry 1977; Weitzman and Géry 1980; Lucena 1987; Ploeg 1991; Buckup 1993; Mago-Leccia 1994; Buckup and Reis 1997; Retzer and Page 1997; Sousa and Rapp Py-Daniel 2005; Rommer 2006), as well as the aid of fish taxonomists of INPA, *Museu de Zoologia da Universidade de São Paulo* (MZUSP), *Museu de Zoologia da Universidade de Londrina* (MZUEL), *Laboratório de Ictiologia da FFCL-USP-Ribeirão Preto* (LIRP), Academy of Natural Sciences of Philadelphia (ANSP), and *Museu Paraense Emilio Goeldi* (MPEG). Voucher specimens are deposited in the INPA Fish Collection (Table 1). Scale bars in the photos of voucher specimens represents 1 cm.

Fish species composition was compared for the whole set of streams and for the Catuá and Ipixuna basins using Jaccard's coefficient (for presence-absence data). The coefficient values varies from 0 (completely different) to 1 (highly similar; Krebs 1999). A Student's *t* test was employed to compare the mean similarity values among streams of Catuá and Ipixuna basins (Zar 1996).

An overall estimate of the fish species richness in the Catuá-Ipixuna RESEX was calculated by means of the Jackknife 1 method (Krebs 1999). Species richness and similarity values are presented as mean ± standard deviation (sd). Statistical analyses were conducted using Past software (Hammer et al. 2001). Fish were collected with IBAMA authorization number 11696-2.

Results and Discussion

A total of 1,525 specimens were captured, belonging to 78 species, 24 families and eight orders (Appendix 1 - Table 1, Appendix 2 - Figures 2 to 78). The ichthyofauna was composed by 33 species of Characiformes (42.3 %), 17 Siluriformes (21.8 %), 14 Perciformes (17.9 %), eight Gymnotiformes (10.3 %), three Cyprinodontiformes (3.8 %), one Synbranchiformes (1.3 %), one Beloniformes (1.3 %) and one Myliobatiformes (1.3 %).

Characiformes (830 specimens, 54.4%) was the most abundant group in the samples, followed by Perciformes (349 specimens, 22.9 %), Siluriformes (268 specimens, 17.6 %), Gymnotiformes (40 specimens, 2.6 %), Cyprinodontiformes (32 specimens, 2.1 %), Synbranchiformes (four specimens, 0.3 %), Beloniformes and Myliobatiformes (one specimen, ≅ 0.1 % each) (Table 1). Eight species had higher abundances and represented together 61.4 % of all collected specimens: *Hemigrammus belotii* (Steindachner, 1882) (24.3 %), *Microphilypnus amazonicus* Myers,1927 (7.3 %), *Physopyxis ananas* Sousa & Rapp Py-Daniel, 2005 (5.9 %), *Apistogramma agassizii* (Steindachner, 1875) (5.0 %), *Elachocharax pulcher* Myers, 1927 (4.9 %), *Apistogramma* cf. *cruzi* Kullander, 1986 (4.8 %), *Gladioglanis conquistador* Lundberg, Bornbusch & Mago-Leccia, 1991 (4.6 %) and *Copella nigrofasciata* (Meinken, 1952) (3.9 %) (Appendix 2, Figure 79).

None of the sampled species was found in all of the investigated streams. Two species (*Hemigrammus belotii* and *Hemigrammus ocellifer* (Steindachner, 1882)) occurred in eight streams, one (*Copella nigrofasciata*) in seven, another one (*Elachocharax pulcher*) in six, and four species (*Gladioglanis conquistador*, *Microphilypnus amazonicus*, *Microsternarchus bilineatus* Fernández-Yépez, 1968 and *Rivulus*

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

cf. *compressus* Henn, 1916) were found in five streams (Table 1). Besides, 52 species (67% of the total species richness) occurred in just one or two streams.

Species richness in the samples ranged 10 - 26 (20 ± 7 sd). The overall fish richness estimated for the Catuá-Ipixiuna RESEX was 106 species. Overall, fish assemblage similarity values were low and ranged 0.03 - 0.35 (0.18 ± 0.08 sd). There was no significant difference in mean similarity values among the streams of the Catuá (0.17 ± 0.01 sd, n=6) and Ipixuna (0.20 ± 0.01 sd; n=10) basins (t= -5.63; p=0.582). Comparing the streams of the two basins, 22 species occurred exclusively in the Catuá and 21 in the Ipixuna. Thirty five species were common to both basins. Among the fishes that occurred in just one of the sampled basins were species of the genera *Gymnotus*, *Aequidens*, *Apistogramma* and *Nannostomus*, with different species in each basin (Table 1).

Studies about the composition of fish communities of small streams in Central Amazon sometimes diverge in relation to the dominance of the taxonomic groups that compose the ichthyofauna. Most studies generally point out to the dominance of Characiformes and Siluriformes (Araújo-Lima et al. 1999; Mendonça et al. 2005), although sometimes Perciformes can be the second in number of representatives, with approximately two times the amount of species of Siluriformes and Gymnotiformes together (e.g. Silva 1995; Buhrnheim and Cox-Fernandes 2001; Espírito-Santo et al. 2009). In the small streams of the Catuá-Ipixuna Extractive Reserve, Characiformes constituted more than half of the specimens collected, mainly small midwater characins such as the ubiquitous *Hemigrammus belotii*. The abundance of Perciformes in our samples resulted from the large number of specimens of the minute gobiid *Microphilypnus amazonicus*, as well as the dwarf cichlid *Apistogramma agassizii*, an also very common species in the Amazon lowlands (Kullander 1986).

Fish species richness in Amazon streams is known from several studies developed in *terra firme* areas in Central Amazon, with numbers varying between 17 and 61 species albeit being obtained with the use of diverse sampling efforts and methodologies (Sabino and Zuanon 1998; Araújo-Lima et al. 1999; Buhrnheim and Cox-Fernandes 2001; Mendonça et al. 2005; Anjos and Zuanon 2007). As far as we know, only Henderson and Walker (1990) studied the fish fauna of a stream subjected to periodic flooding, although focusing on species associated to litter banks. The species richness found in the Catuá-Ipixuna streams (78 species) may be considered high due to the small number of streams sampled (nine) in a single occasion, and to the fact that only hand nets were employed as sampling equipment. However, this high number of species may have been influenced by the close proximity and sometimes direct connection of the sampled streams to larger, main water courses of those basins. For instance, specimens of the gobiid *Microphilypnus amazonicus* were commonly found close to the main streams of the basins.

Among the species collected there were some fishes that constitute typical inhabitants of well preserved forested streams such as *Helogenes marmoratus* Gunther, 1863 (Cetopsidae) and *Monocirrhus polyacanthus* Heckel, 1840 (Polycentridae). Some species were found in most of the streams sampled, such as *Apistogramma* spp. (Cichlidae) and *Elachocharax pulcher* (Crenuchidae), always associated to litter banks.

Based on the high number of singletons and doubletons present in our samples, as well as the estimated number of species for those streams (106 spp.), we believe that the total fish species richness present in the Catuá-Ipixuna Extractive Reserve may be considerably higher than indicated by our samples. This seems especially true when considering the dimensions of the Catuá-Ipixuna RESEX and the dense hydrographic network present in the area. Further efforts should be directed to the study of the ichthyofauna of the small streams of floodplain areas in the Amazon, which had been largely negleted so far.

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

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Appendix 1

Table 1. Ichthyofaunal composition of nine streams at Catuá-Ipixuna Extractive Reserve, including the number of fish collected and INPA Fish Collection voucher specimens. C= Catuá; I= Ipixuna; T= Total.

TAXON	C.	I.	T.	INPA
BELONIFORMES				
Belonidae				
Potamorrhaphis guianensis (Jardine, 1843)	0	1	1	27268
CHARACIFORMES				
Characidae				
Aphyocharacidium sp.	1	1	2	27327; 27535
Axelrodia stigmatias (Fowler, 1913)	14	24	38	27317; 27338; 27339
Charax sp.	1	0	1	27319
Gephyrocharax sp.	0	1	1	27334
Hemigrammus belotii (Steindachner, 1882)	239	131	370	27313; 27316; 27318; 27325; 27329; 27331; 27335; 27342
Hemigrammus aff. *gracilis* (Lutken, 1875)	20	0	20	27322
Hemigrammus ocellifer (Steindachner, 1882)	30	5	35	27309; 27314; 27320; 27324; 27328; 27332; 27336; 27341
Hemigrammus stictus (Durbin, 1909)	1	0	1	27312
Hyphessobrycon bentosi Durbin, 1908	39	0	39	27310; 27326

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

TAXON	C.	I.	T.	INPA
Hyphessobrycon (*Megalamphodus*) sp.	8	10	18	27321; 27337
Hyphessobrycon melazonatus Durbin, 1908	29	0	29	27323
Microschemobrycon casiquiare Bohlke, 1953	1	0	1	27330
Moenkhausia oligolepis (Gunther, 1864)	0	3	3	27333
Phenacogaster microstictus Eigenmann, 1909	3	0	3	27306; 27311
Priocharax pygmaeus Weitzman & Vari, 1987	0	13	13	27343
Tyttocharax madeirae Fowler, 1913	5	2	7	27344; 27345; 27346
Crenuchidae				
Characidium aff. *pteroides* Eigenmann, 1909	8	0	8	27281
Characidium sp.1	3	1	4	27190; 27267; 27532
Characidium sp.2	6	1	7	27533; 27534
Crenuchus spilurus Gunther, 1863	14	1	15	27216; 27221; 27291
Elachocharax pulcher Myers, 1927	14	62	76	27199; 27209; 27218; 27243; 27251; 27264
Microcharacidium weitzmani Buckup, 1993	8	0	8	27230
Odontocharacidium aphanes (Weitzman & Kanazawa, 1977)	4	11	15	27315; 27340
Odontocharacidium sp.	2	2	4	27202; 27244
Erythrinidae				
Erythrinus erythrinus (Bloch & Schneider, 1801)	0	1	1	27200
Hoplias malabaricus (Bloch, 1794)	5	0	5	27295; 27296
Gasteropelecidae				
Carnegiella strigata (Gunther, 1864)	3	10	13	27232; 27258
Lebiasinidae				
Copella nigrofasciata (Meinken, 1952)	48	12	60	27220; 27227; 27241; 27246; 27285; 27290; 27301
Nannostomus eques Steindachner, 1876	4	7	11	27233; 27260; 27294
Nannostomus marginatus Eigenmann, 1909	5	0	5	27263; 27297
Nannostomus unifasciatus Steindachner, 1876	0	1	1	27225
Pyrrhulina brevis Steindachner, 1876	0	9	9	27188; 27282
Pyrrhulina laeta (Cope, 1872)	2	5	7	27192; ; 27242; 27280; 27289
CYPRINODONTIFORMES				
Rivulidae				
Rivulus atratus Garman, 1895	0	3	3	27252
Rivulus cf. *compressus* Henn, 1916	6	12	18	27197; 27224; 27269; 27272; 27277
Rivulus ornatus Garman, 1895	1	10	11	27201; 27257; 27270
GYMNOTIFORMES				
Gymnotidae				
Gymnotus anguillaris Hoedeman, 1962	6	0	6	27299
Gymnotus cf. *cataniapo* Mago-Leccia, 1994	0	1	1	27274
Hypopomidae				
Brachyhypopomus sp.	3	2	5	27191; 27222
Hypopygus lepturus Hoedeman, 1962	0	1	1	27248
Microsternarchus bilineatus Fernández-Yépez, 1968	1	10	11	27204; 27206; 27231; 27237; 27256
Microsternarchus sp.	0	3	3	27203; 27278
Steatogenys duidae (La Monte, 1929)	1	0	1	27253
Rhamphichthyidae				
Gymnorhamphichthys rondoni (Miranda-Ribeiro, 1920)	8	4	12	27235; 27279; 27302
MYLIOBATIFORMES				
Potamotrygonidae				
Potamotrygon constellata (Vaillant, 1880)	1	0	1	Uncatalogued

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

TAXON	C.	I.	T.	INPA
PERCIFORMES				
Cichlidae				
Acaronia nassa (Heckel, 1840)	0	1	1	27254
Aequidens cf. *pallidus* (Heckel, 1840)	1	0	1	27303
Aequidens tetramerus (Heckel, 1840)	0	1	1	27198
Apistogramma agassizii (Steindachner, 1875)	11	74	85	27539; 27544; 27549; 27550
Apistogramma bitaeniata Pellegrin, 1936	16	28	44	27538; 27541; 27546
Apistogramma cf. *cruzi* Kullander, 1986	65	9	74	27208; 27271; 27542
Apistogramma hippolytae Kullander,1982	8	0	8	27537
Apistogramma aff. *meinkeni* Kullander, 1980	0	5	5	27545
Bujurquina cf. *syspilus* (Cope, 1872)	0	1	1	27189
Crenicara punctulatum (Gunther, 1863)	2	1	3	27226; 27240
Crenicichla inpa Ploeg, 1991	3	3	6	27195; 27214; 27273
Crenicichla regani Ploeg, 1989	2	6	8	27223; 27262; 27300
Gobiidae				
Microphilypnus amazonicus Myers, 1927	62	49	111	27536; 27540; 27543; 27547;
Polycentridae				
Monocirrhus polyacanthus Heckel, 1840	0	1	1	27187
SILURIFORMES				
Aspredinidae				
Bunocephalus verrucosus (Walbaum, 1792)	1	1	2	27234; 27239
Callichthyidae				
Corydoras elegans Steindachner, 1877	5	0	5	27307
Cetopsidae				
Denticetopsis seducta Vari, Ferraris & de Pinna, 2005	1	1	2	27219; 27304
Helogenes marmoratus Gunther, 1863	1	3	4	27186; 27293
Doradidae				
Physopyxis ananas Sousa & Rapp Py-Daniel, 2005	0	90	90	27236; 27247
Heptapteridae				
Gladioglanis conquistador Lundberg, Bornbusch & Mago-Leccia, 1991	1	69	70	27213; 27238; 27245; 27275; 27276
Loricariidae				
Ancistrus sp.	14	0	14	27255; 27288
Farlowella amazona (Gunther, 1864)	3	6	9	27196; 27215; 27283; 27298
Otocinclus cf. *batmani* Lehmann, 2006	4	0	4	27261
Rineloricaria lanceolata (Gunther, 1868)	1	0	1	27292
Pseudopimelodidae				
Microglanis aff. *poecilus* Eigenmann, 1912	10	3	13	27194; 27228; 27249; 27250
Scoloplacidae				
Scoloplax dicra Bailey & Baskin, 1976	38	0	38	27210; 27259
Trichomycteridae				
Ammoglanis aff. *pulex* de Pinna & Winemiller, 2000	2	6	8	27207; 27212; 27265
Ituglanis cf. *amazonicus* (Steindachner, 1882)	3	0	3	27305
Miuroglanis platycephalus Eigenmann & Eigenmann, 1889	0	2	2	27205; 27217
Ochmacanthus cf. *reinhardtii* (Steindachner, 1882)	0	1	1	27229
Trichomycterus johnsoni (Fowler, 1932)	0	2	2	27211; 27266
SYNBRANCHIFORMES				
Synbranchidae				
Synbranchus sp.	2	2	4	27193; 27284; 27286; 27287
TOTAL	**800**	**725**	**1525**	

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Appendix 2

Beloniformes

Belonidae

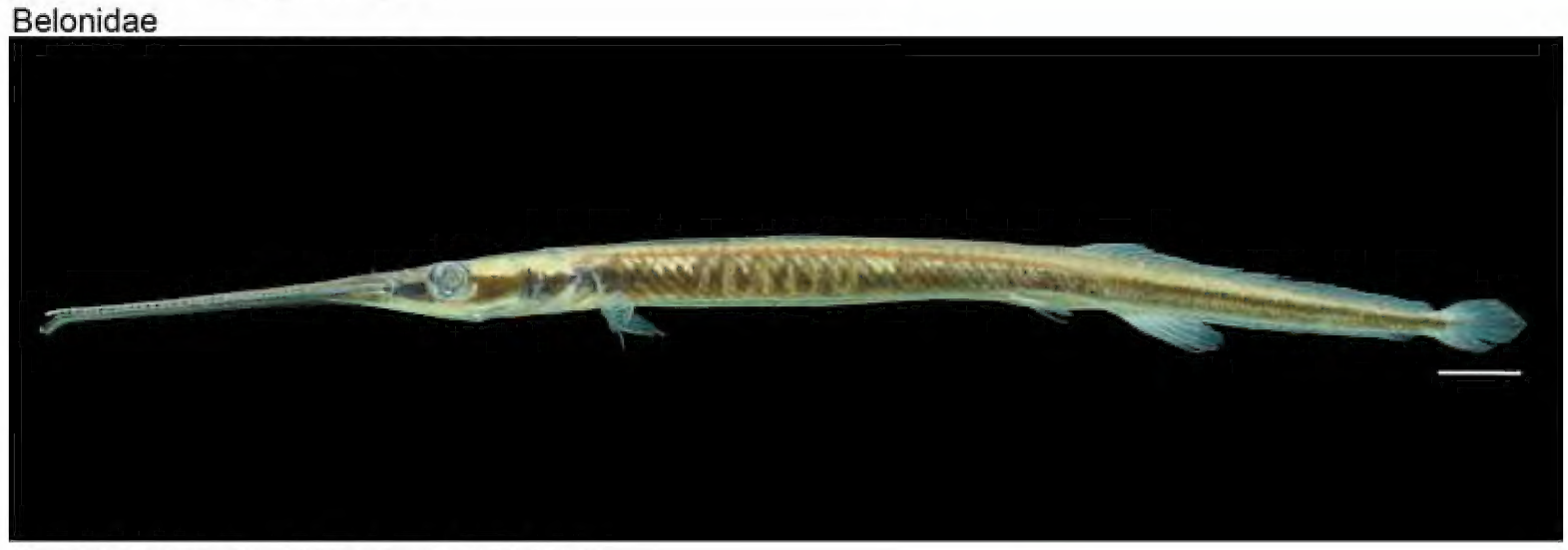

Figure 2. *Potamorrhaphis guianensis* INPA-27268

Characiformes

Characidae

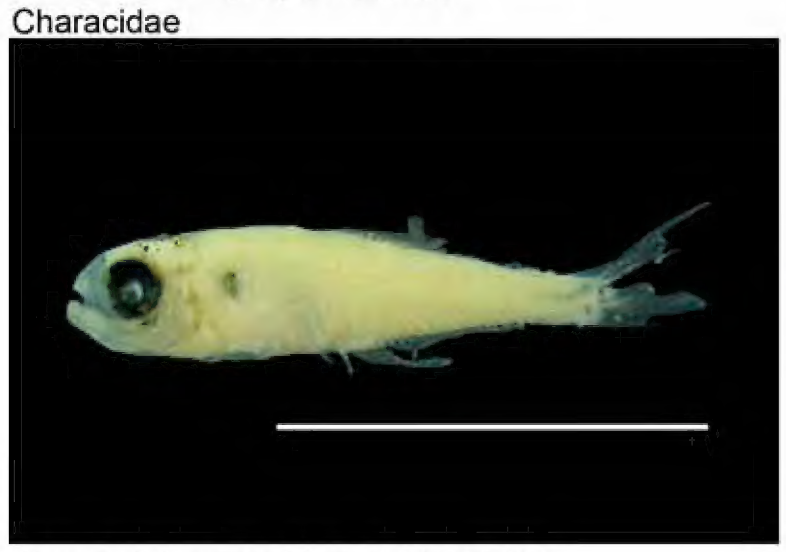

Figure 3. *Aphyocharacidium sp.* INPA-27327

Figure 6. *Gephyrocharax* sp. INPA-27334

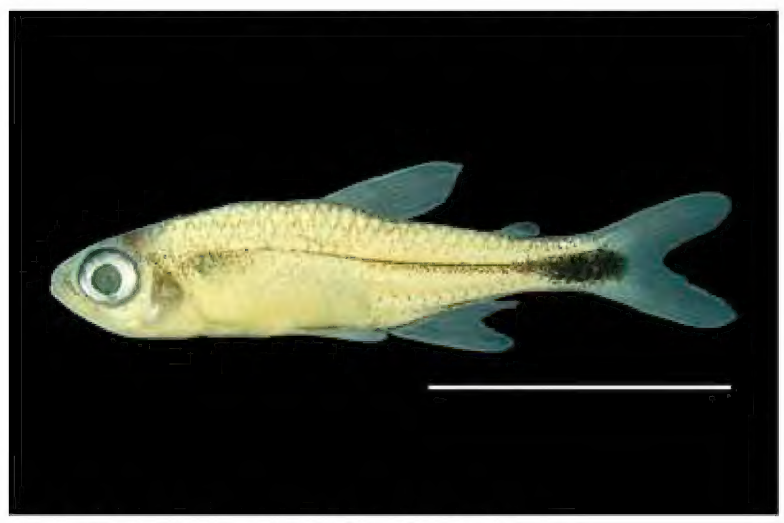

Figure 4. *Axelrodia stigmatias* INPA-27339

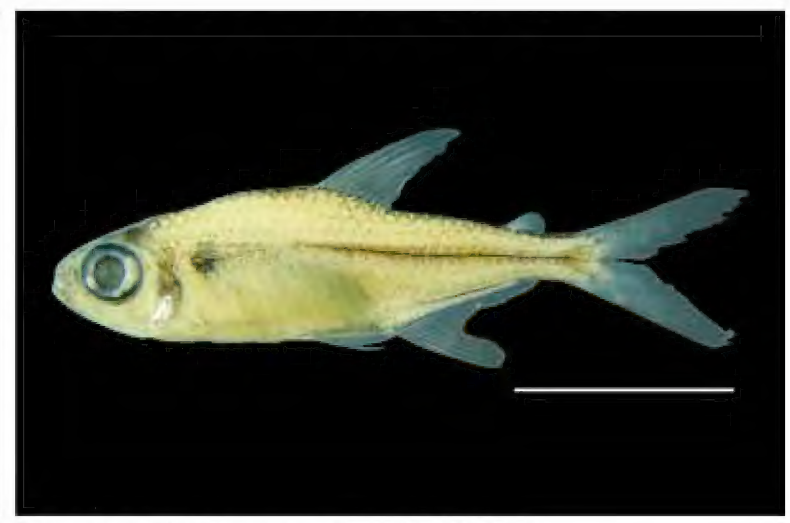

Figure 7. *Hemigrammus belotii* INPA-27329

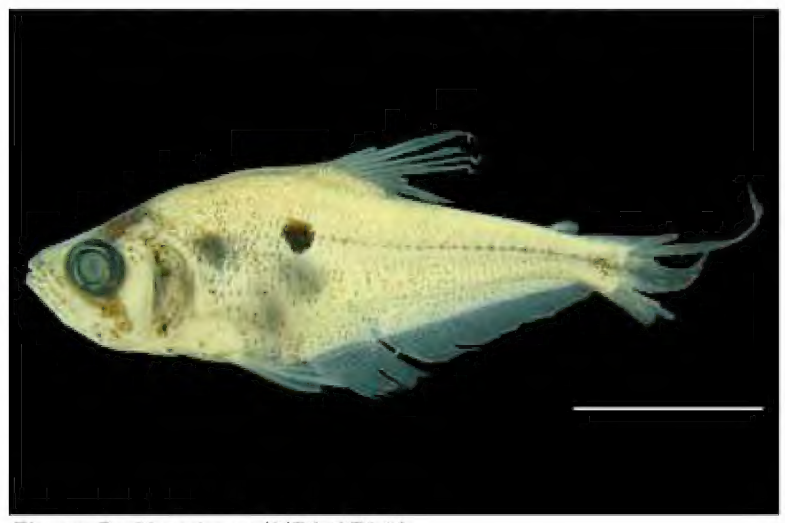

Figure 5. *Charax* sp. INPA-27319

Figure 8. *Hemigrammus* aff. *gracilis* INPA-27322

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Characiformes

Characidae

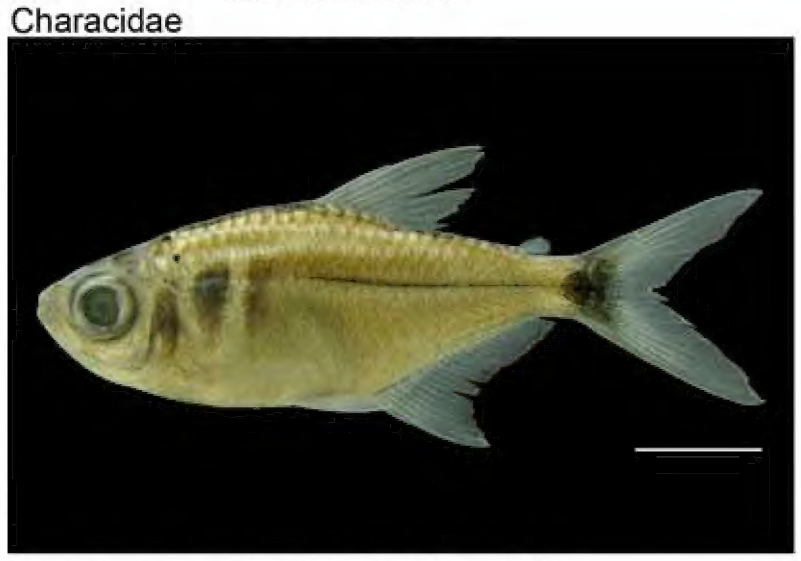

Figure 9. *Hemigrammus ocellifer* INPA-27341

Figure 10. *Hemigramus stictus* INPA-27312

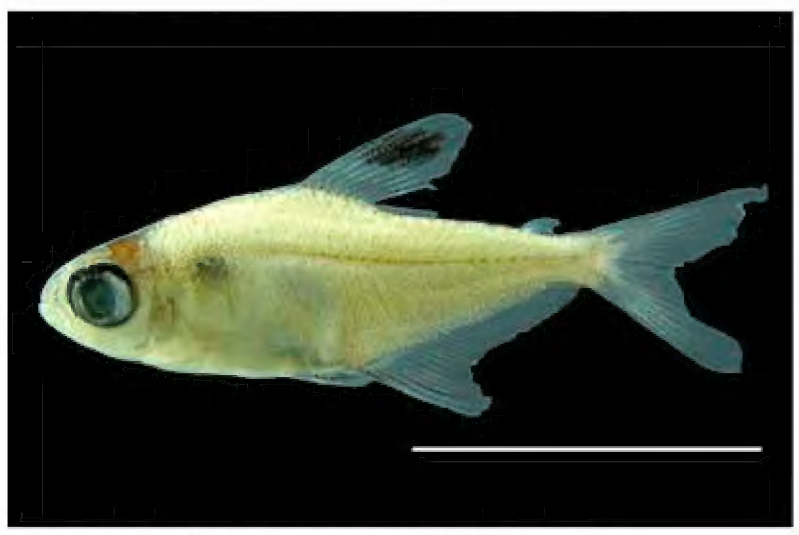

Figure 11. *Hyphessobrycon bentosi* INPA-27326

Figure 13. *Hyphessobrycon melazonatus* INPA-27323

Figure 14. *Microschemobrycon casiquiare* INPA-27330

Figure 15. *Moenkhausia oligolepis* INPA-27333

Figure 12. *Hyphessobrycon* (*Megalamphodus*) sp. INPA-27337

Figure 16. *Phenacogaster microstictus* INPA-27306

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

Characiformes

Characidae

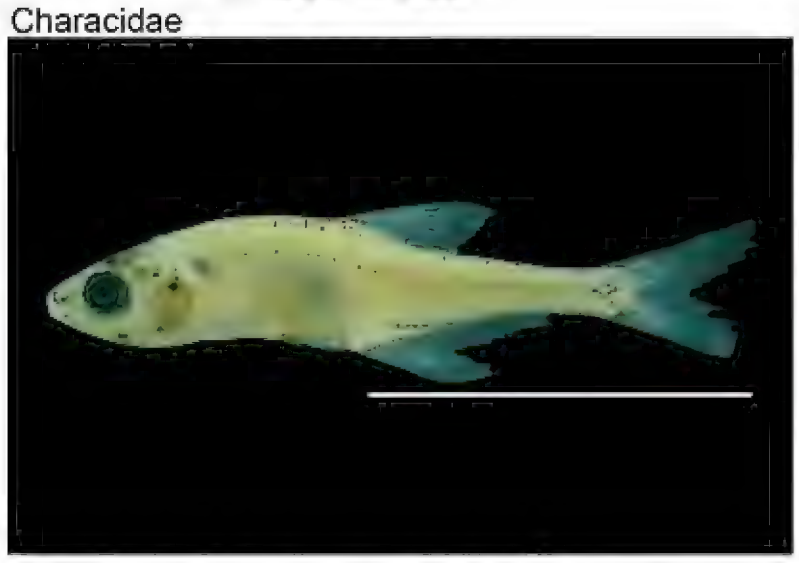

Figure 17. *Priocharax pygmaeus* INPA-27343

Figure 21. *Characidium* sp. 2 INPA-27533

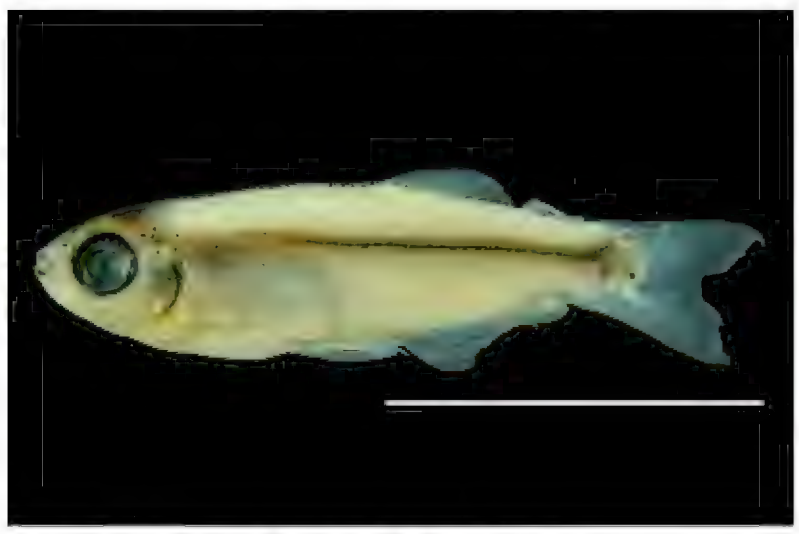

Figure 18. *Tyttocharax madeirae* INPA-27345

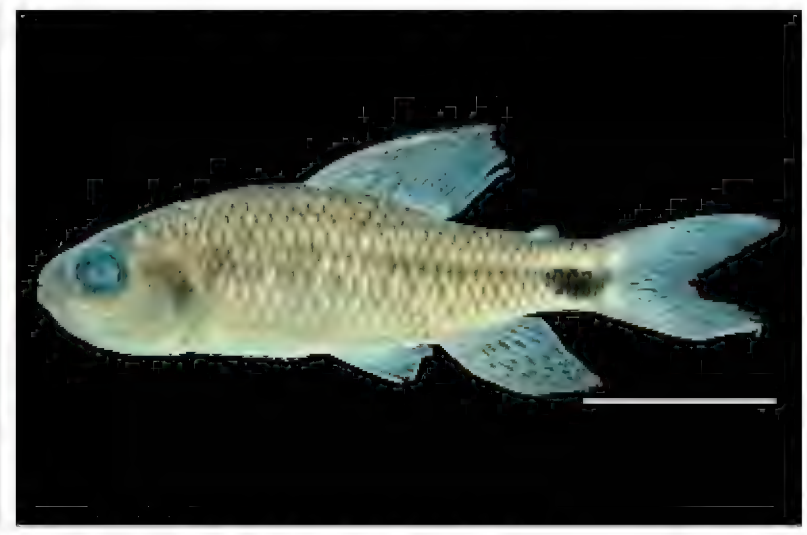

Figure 22. *Crenuchus spilurus* INPA-27291

Crenuchidae

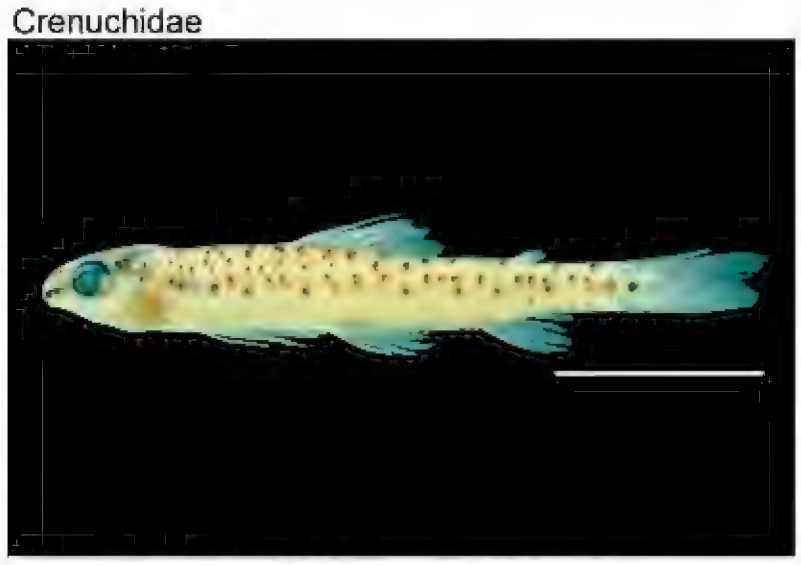

Figure 19. *Characidium* aff. *pteroides* INPA-27281

Figure 23. *Elachocharax pulcher* INPA-27199

Figure 20. *Characidium* sp. 1 INPA-27190

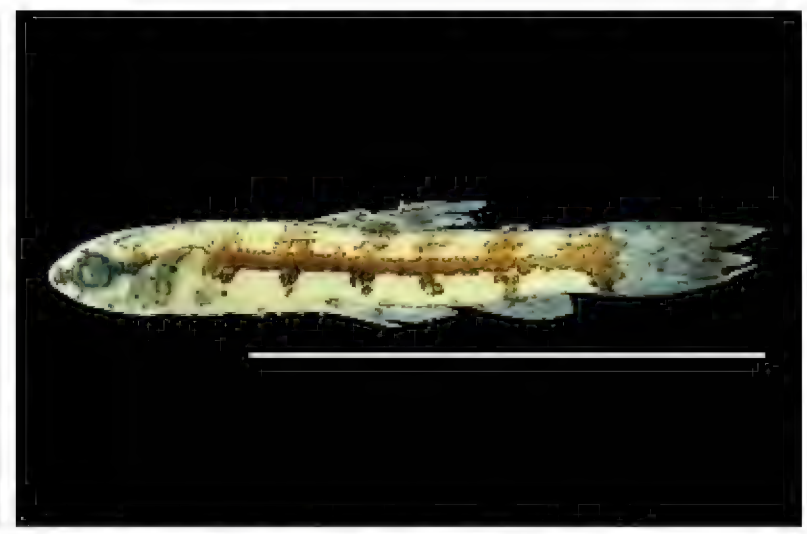

Figure 24. *Microcharacidium weitzmani* INPA-27202

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

Characiformes

Crenuchidae

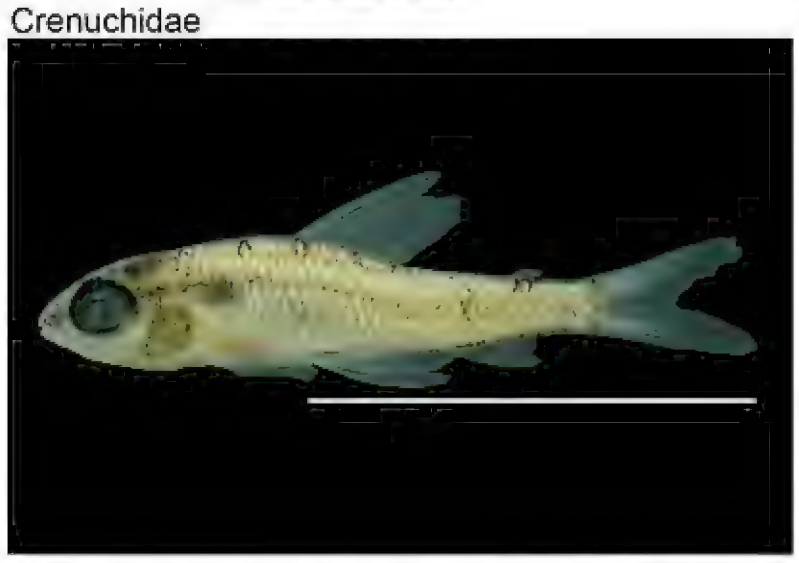

Figure 25. *Odontocharacidium aphanes* INPA-27340

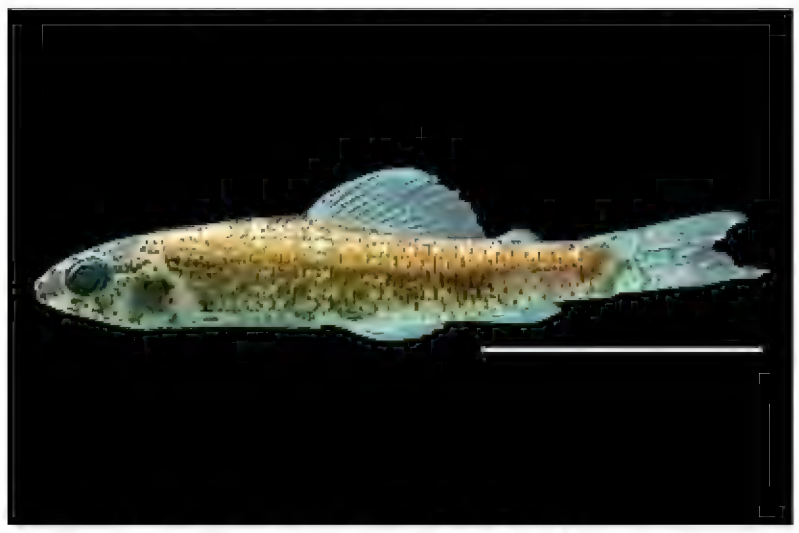

Figure 26. *Odontocharacidium* sp. INPA-27202

Erythrinidae

Figure 27. *Erythrinus erythrinus* INPA-27200

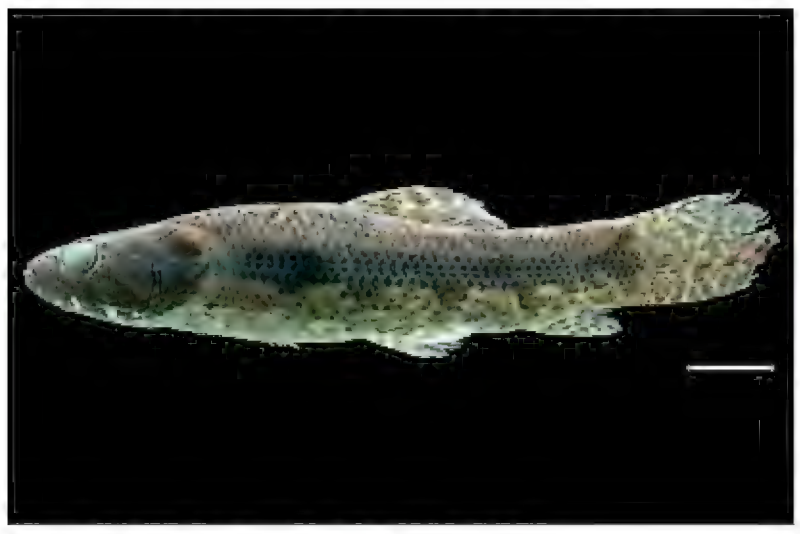

Figure 28. *Hoplias malabaricus* INPA-27296

Gasteropelecidae

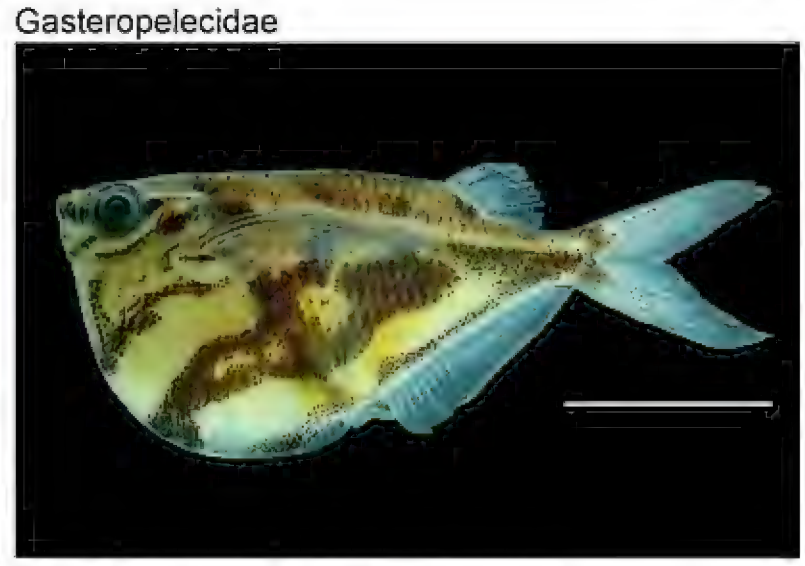

Figure 29. *Carnegiella strigata* INPA-27258

Lebiasinidae

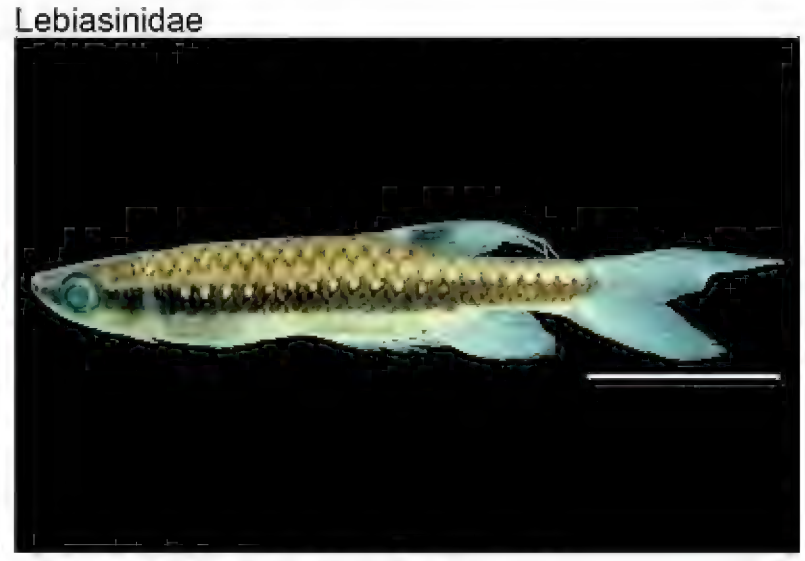

Figure 30. *Copella nigrofasciata* INPA-27301

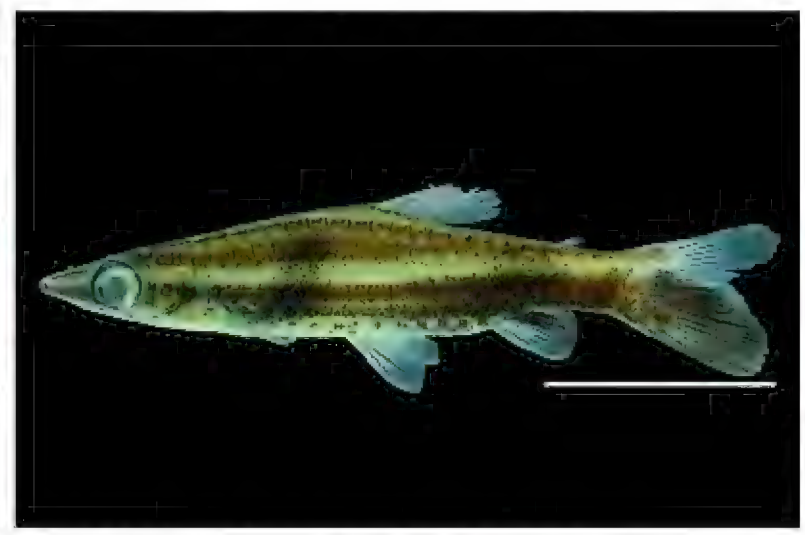

Figure 31. *Nannostomus eques* INPA-27260

Figure 32. *Nannostomus marginatus* INPA-27297

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

Characiformes

Lebiasinidae

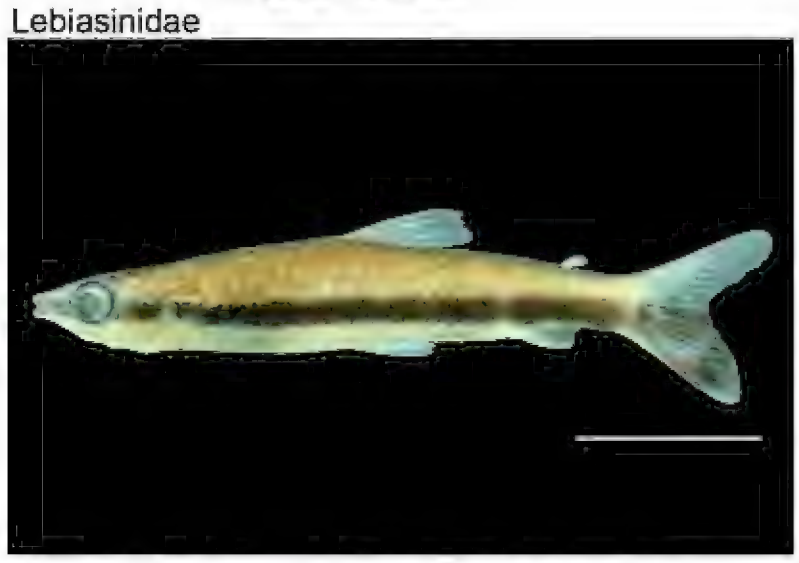

Figure 33. *Nannostomus unifasciatus* INPA-27225

Figure 34. *Pyrrhulina brevis* INPA-27188

Figure 35. *Pyrrhulina laeta* INPA-27242

Cyprinodontiformes

Rivulidae

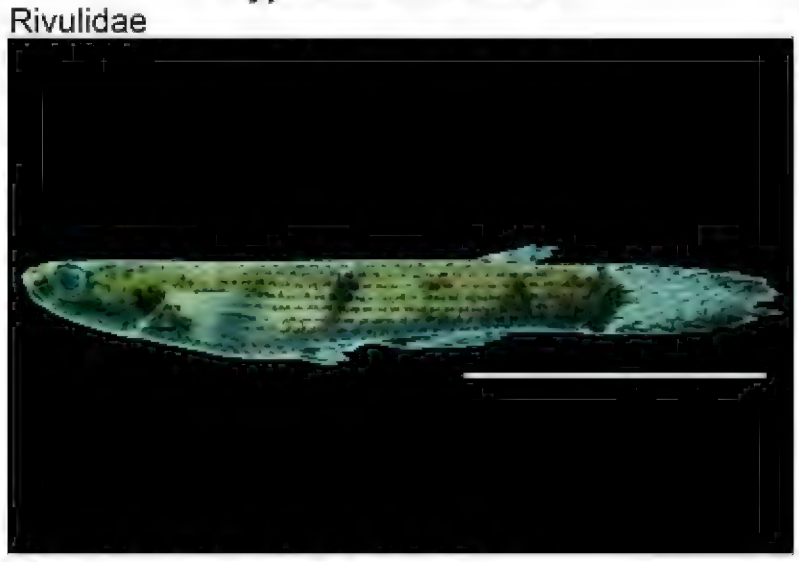

Figure 36. *Rivulus atratus* INPA-27252

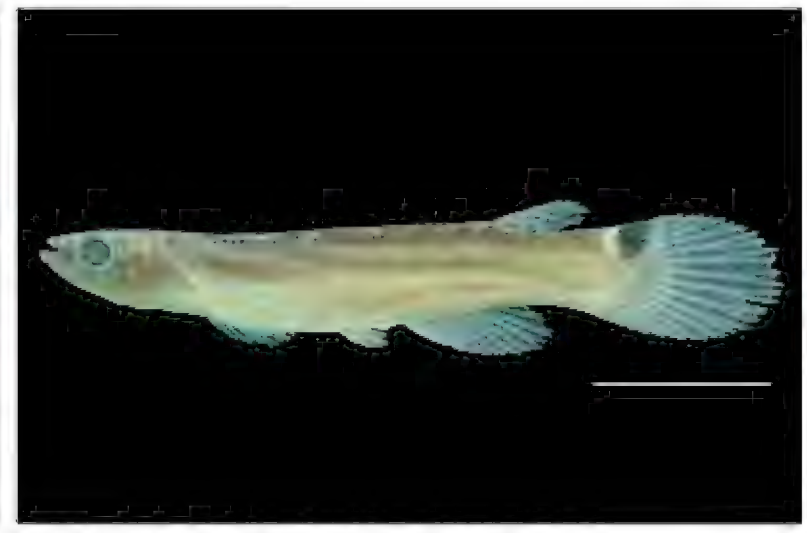

Figure 37. *Rivulus* aff. *compressus* INPA-27269

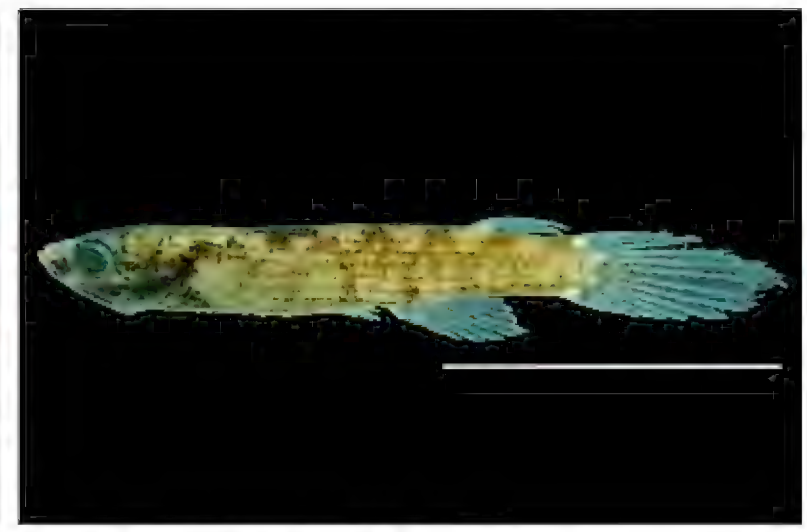

Figure 38. *Rivulus ornatus* INPA-27257

Gymnotiformes

Gymnotidae

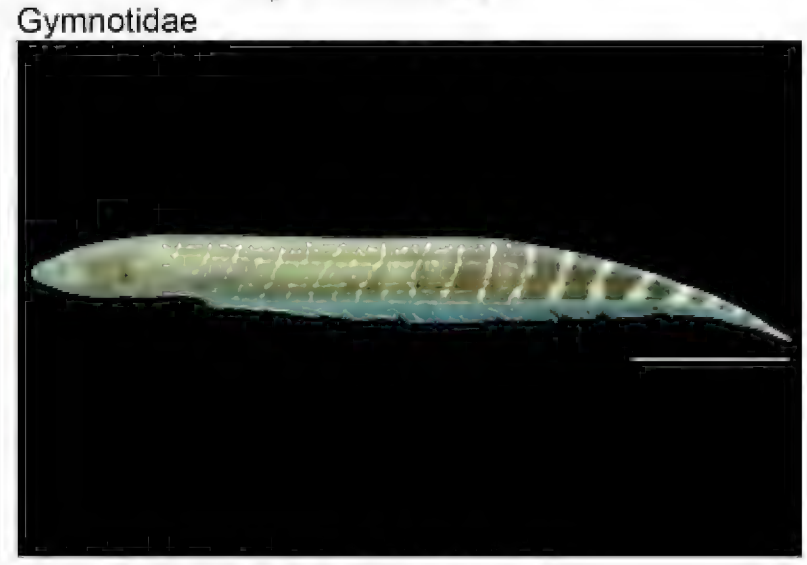

Figure 39. *Gymnotus anguillaris* INPA-27299

Hypopomidae

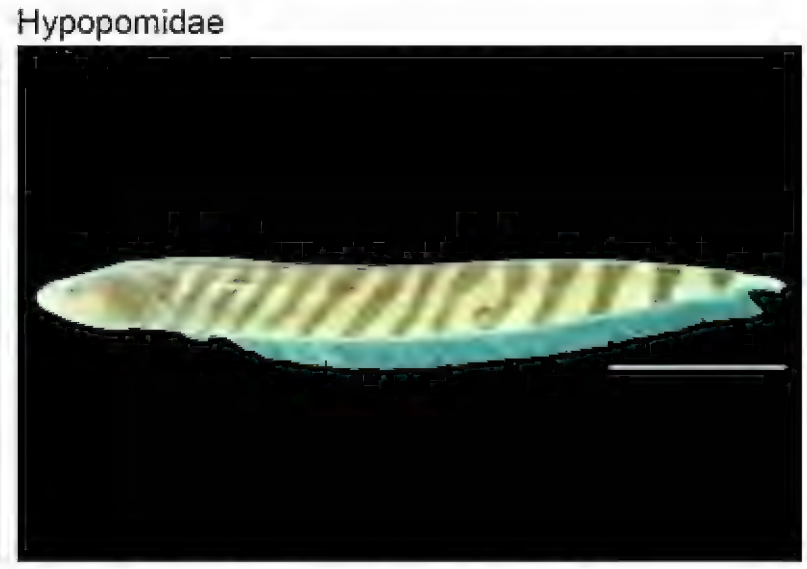

Figure 40. *Gymnotus* cf. *cataniapo* INPA-27274

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Gymnotiformes

Hypopomidae

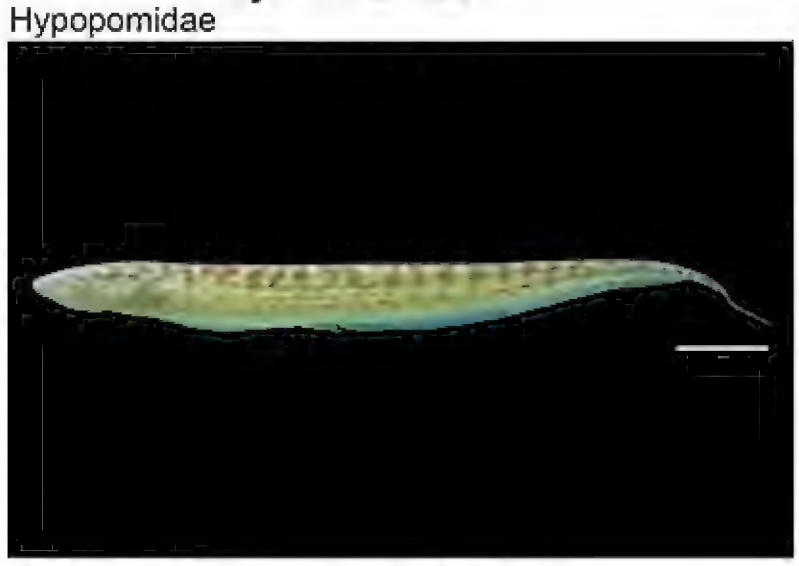

Figure 41. *Brachyhypopomus* sp. INPA-27544

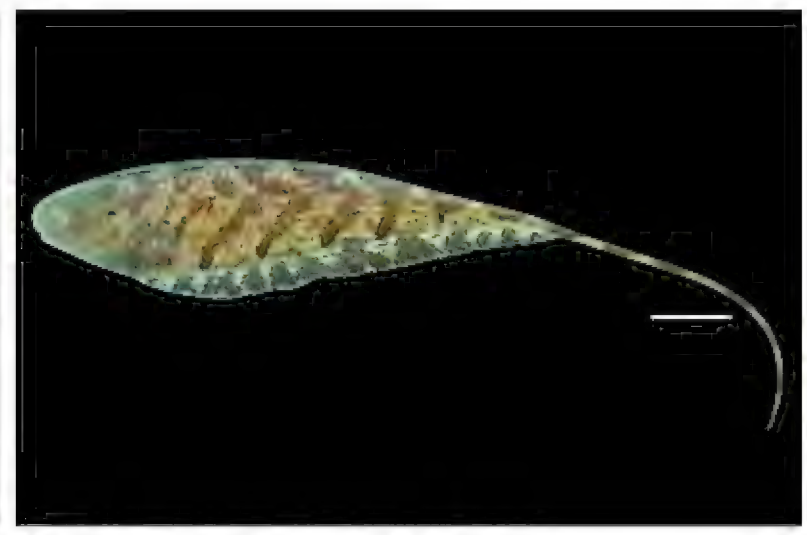

Figure 45. *Steatogenys duidae* INPA-27253

Rhamphichthyidae

Figure 42. *Hypopygus lepturus* INPA-27248

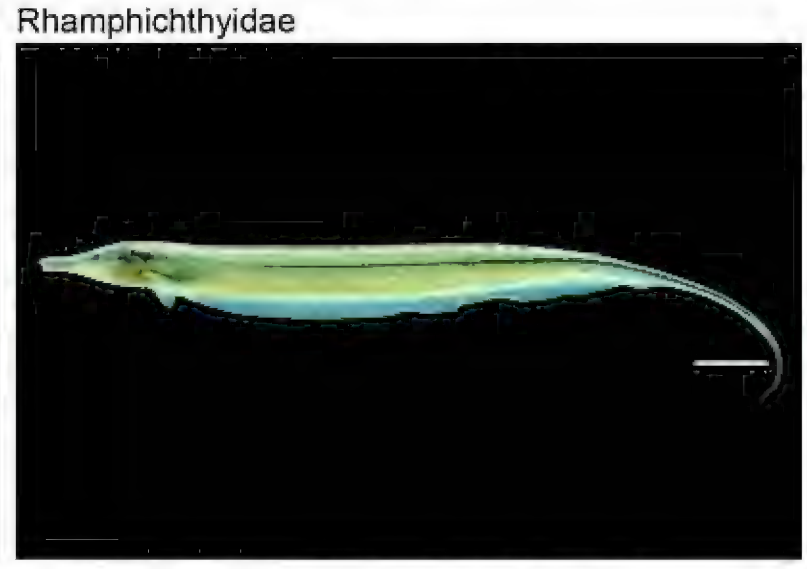

Figure 46. *Gymnorhamphichthys rondoni* INPA-27302

Perciformes

Cichlidae

Figure 43 *Microsternarchus bilineatus* INPA-27204

Figure 47. *Acaronia nassa* INPA-27254

Figure 44. *Microsternarchus* sp. INPA-27203

Figure 48. *Aequidens* cf. *pallidus* INPA-27303

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Perciformes

Cichlidae

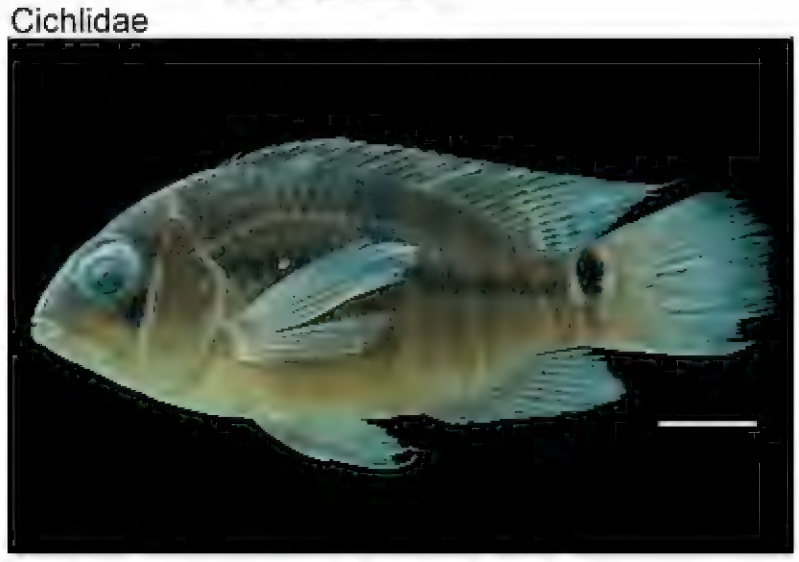

Figure 49. *Aequidens tetramerus* INPA-27189

Figure 53. *Apistogramma hippolytae* INPA-27537

Figure 50. *Apistogramma agassizii* INPA-27544

Figure 54. *Apistogramma* aff. *meinkeni* INPA-27545

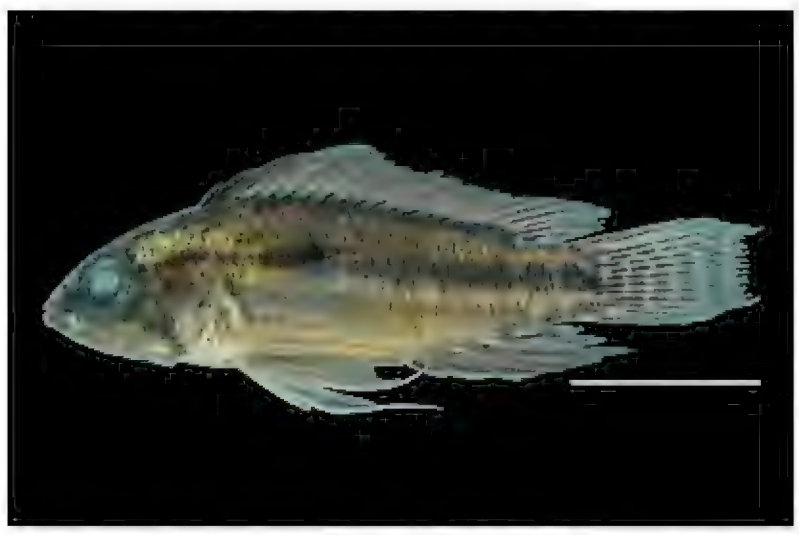

Figure 51. *Apistogramma bitaeniata* INPA-27541

Figure 55. *Burjuquina syspilus* INPA-27189

Figure 52. *Apistogramma* cf. *cruzi* INPA-27542

Figure 56. *Crenicara punctulatum* INPA-27240

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Perciformes

Cichlidae

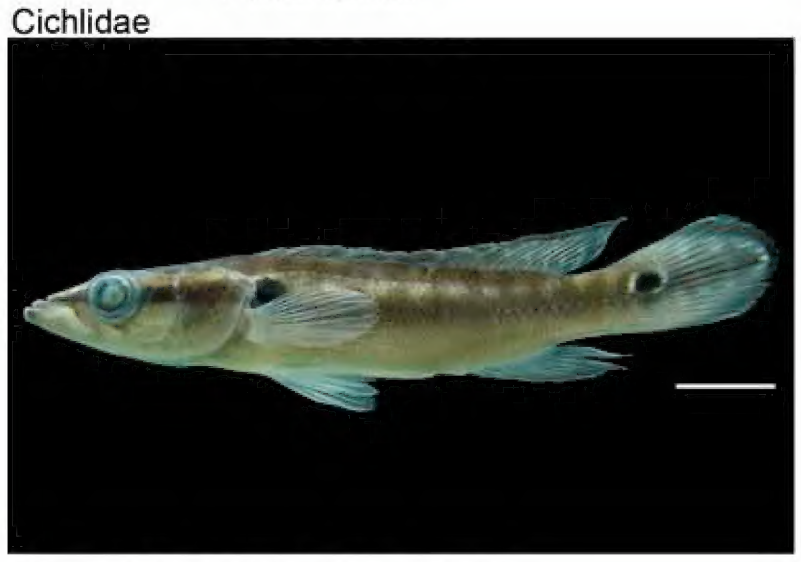

Figure 57. *Crenicichla inpa* INPA-27195

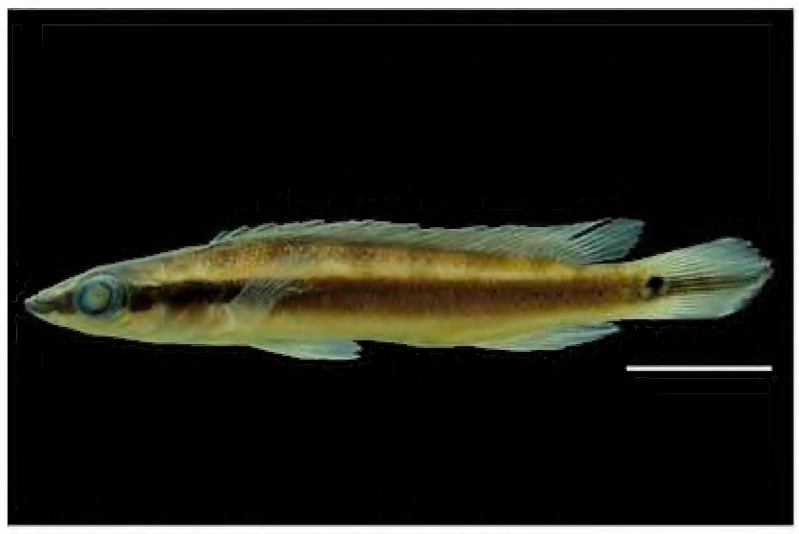

Figure 58. *Crenicichla regani* INPA-27223

Gobiidae

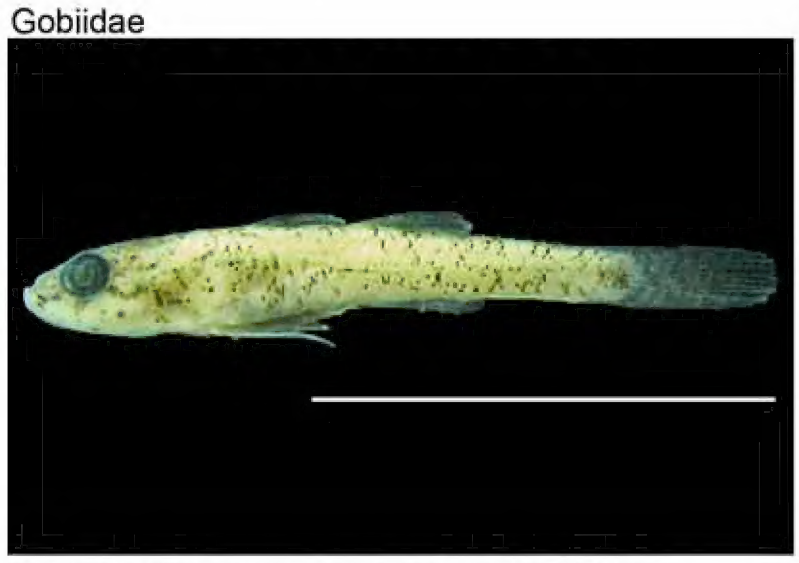

Figure 59. *Microphilypnus amazonicus* INPA-27540

Polycentridae

Figure 60. *Monocirrhus polyacanthus* INPA-27187

Siluriformes

Aspredinidae

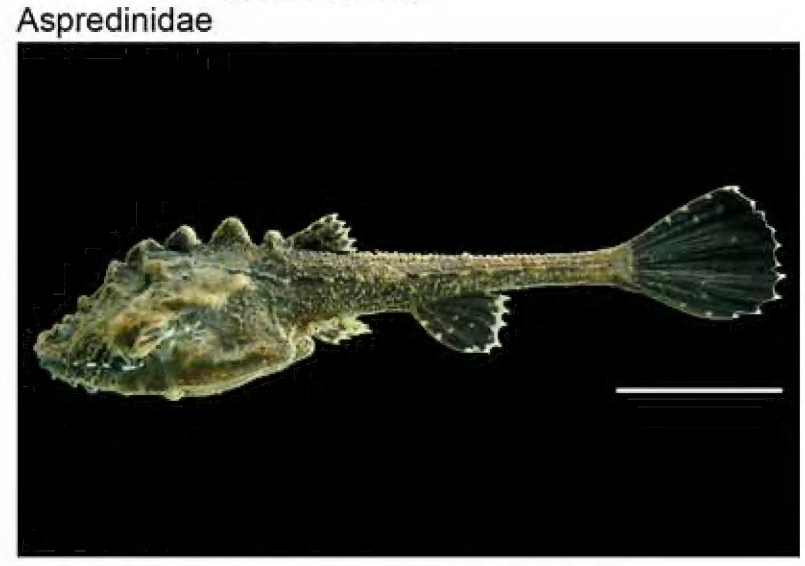

Figure 61. *Bunocephalus verrucosus* INPA-27239

Callichthyidae

Figure 62. *Corydoras elegans* INPA-27307

Cetopsidae

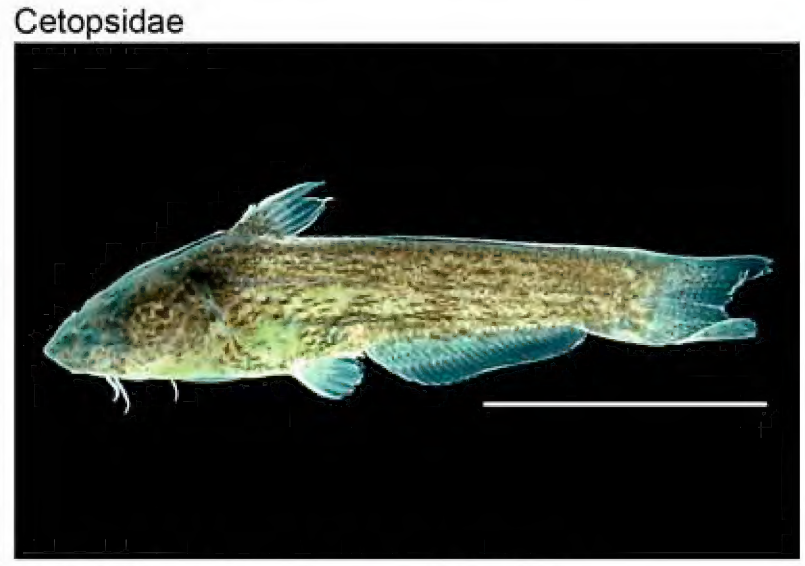

Figure 63. *Denticetopsis seducta* INPA-27304

Figure 64. *Helogenes marmoratus* INPA-27186

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

Siluriformes

Doradidae

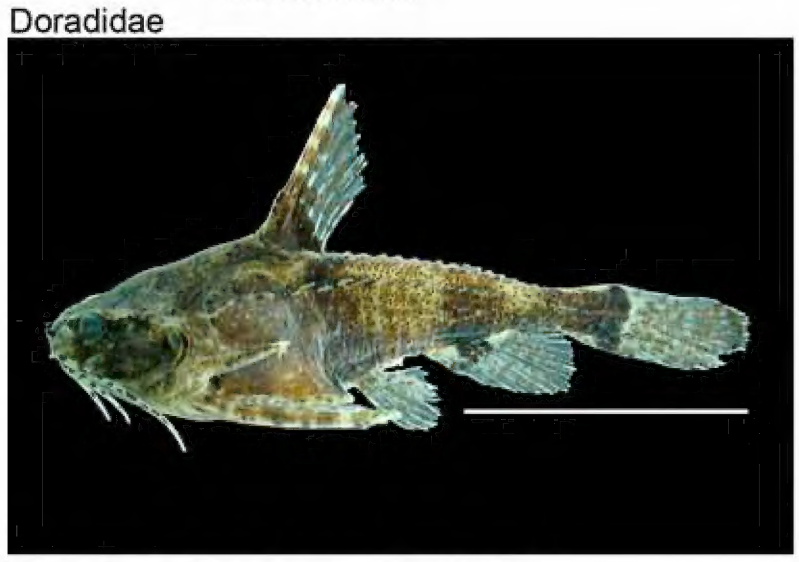

Figure 65. *Physopyxis ananas* INPA-27236

Figure 69. *Otocinclus* cf. *batmani* INPA-27261

Heptapteridae

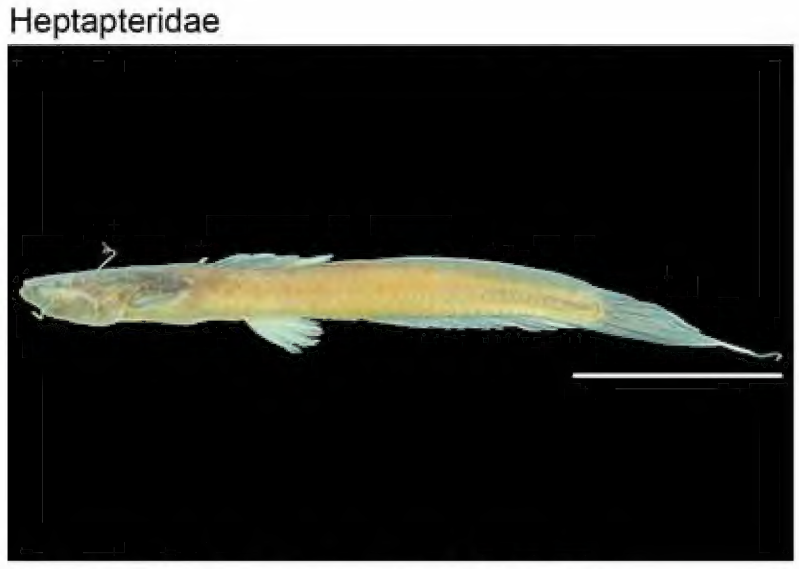

Figure 66. *Gladioglanis conquistador* INPA-27238

Figure 70. *Rineloricaria lanceolata* INPA-27292

Loricariidae

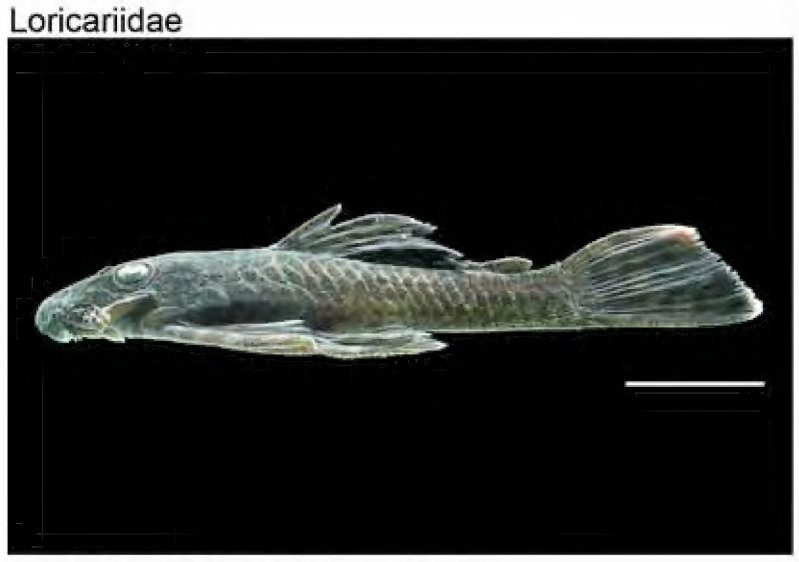

Figure 67. *Ancistrus* sp. INPA-27288

Pseudopimelodidae

Figure 71. *Microglanis* aff. *poecilus* INPA-27250

Scoloplacidae

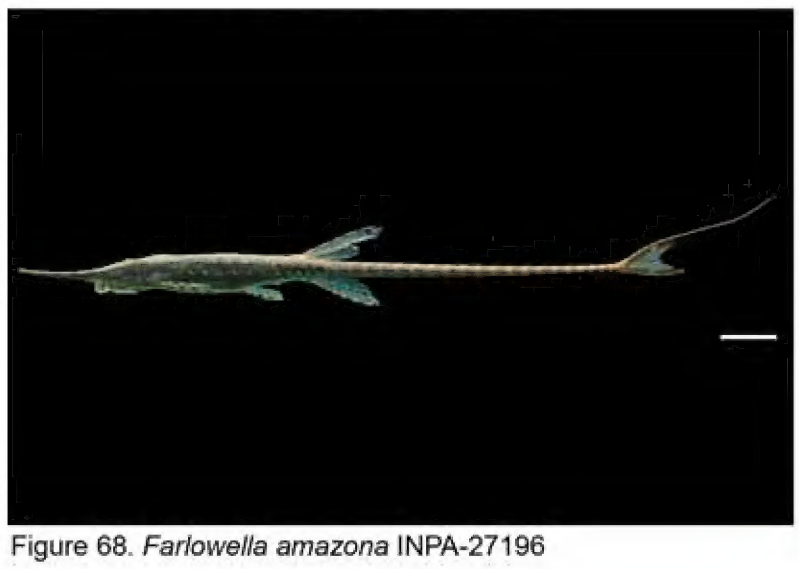

Figure 68. *Farlowella amazona* INPA-27196

Figure 72. *Scoloplax dicra* INPA-27210

Check List **5**(2): 154–172, 2009.
ISSN: 1809-127X

LISTS OF SPECIES

Siluriformes

Trichomycteridae

Figure 73. *Ammoglanis* aff. *pulex* INPA-27207

Figure 76. *Ochmacanthus* cf. *reinhardtii* INPA-27229

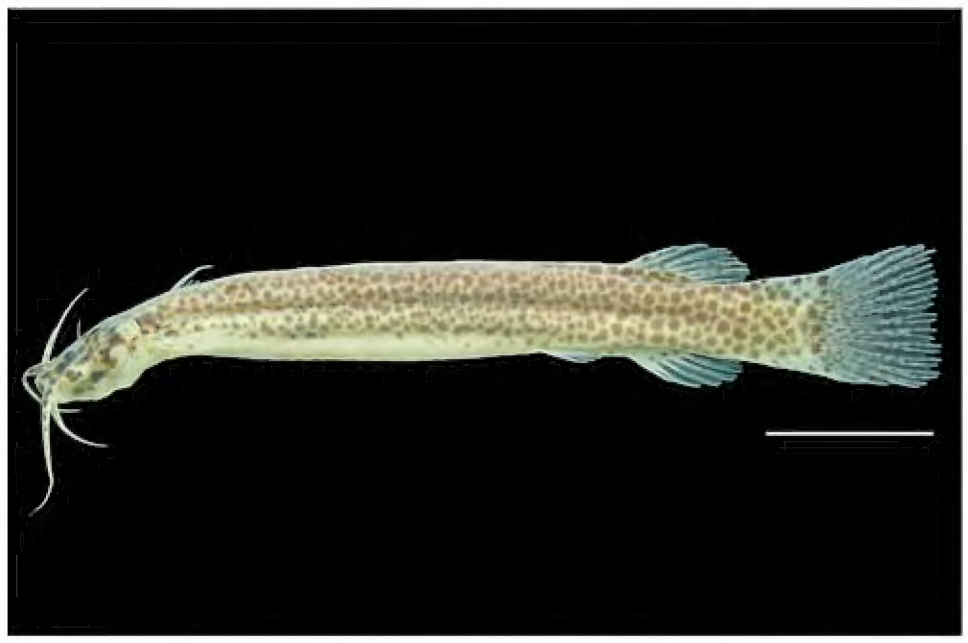

Figure 74. *Ituglanis* cf. *amazonicus* INPA-27305

Figure 77. *Trichomycterus johnsoni* INPA-27266

Synbranchiformes

Synbranchidae

Figure 75. *Miuroglanis platycephalus* INPA-27205

Figure 78. *Synbranchus* sp. INPA-27286

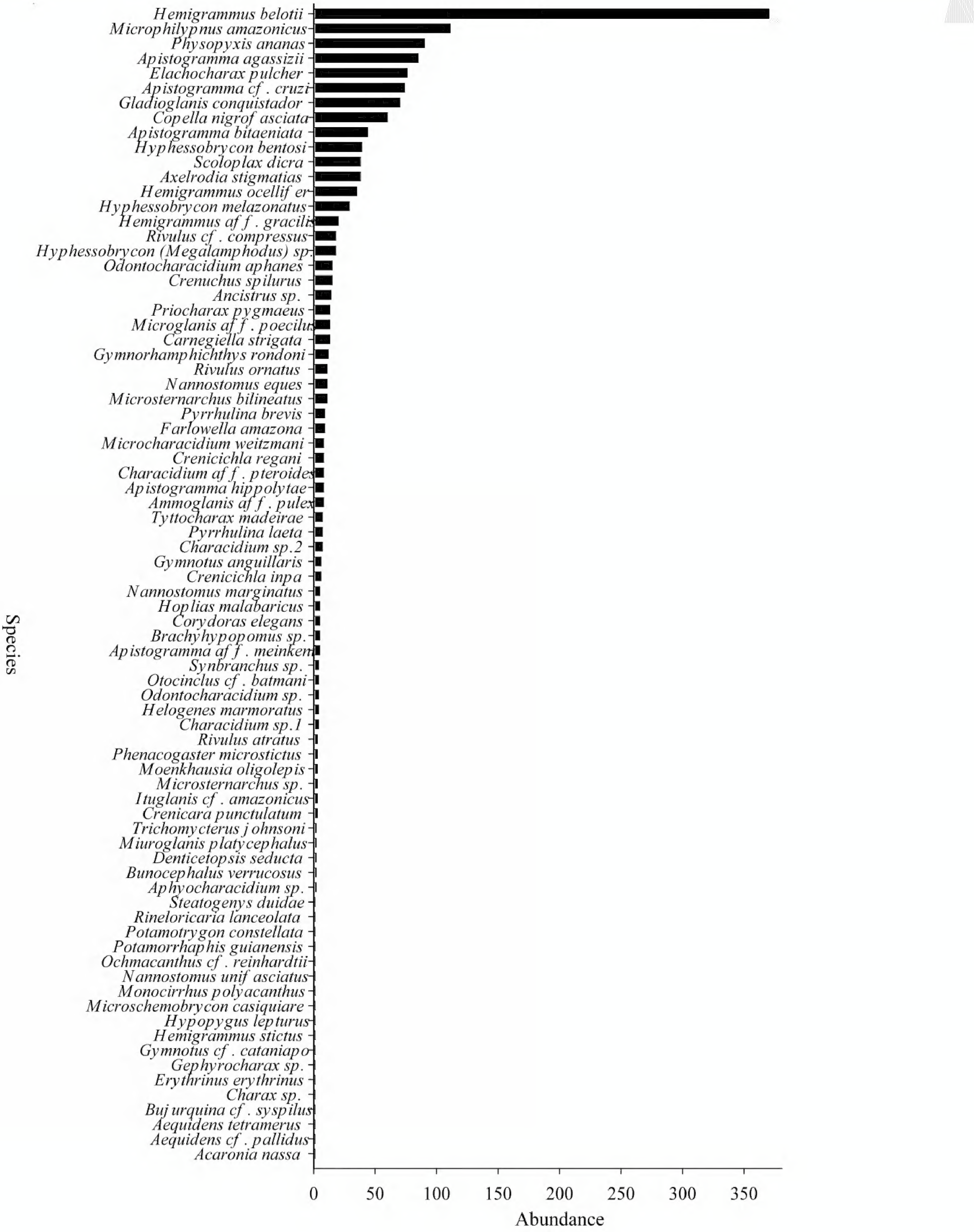

Figura 79. Total abundance (number of specimens) of fish species collected in the streams of Catuá-Ipixuna Extractive Reserve.